

Automation in Water Resources and Hydropower Plant

Course Contents

| Sl. No. | Particulars | Contact Hours |
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| 1. | INTRODUCTION: Sources and forms of energy, types of power plants, elements of hydropower scheme, hydropower development in India, Hydro Powerhouse structures-substructure and superstructure Layout and dimensions, Hydropower plants classification: Surface and underground power stations, Low, medium and high head plants-layout and components, microhydel units, Different curves: Load curves, load duration curve, Connected load, maximum load, peak load, base load and peak load power plants, load factor, plant capacity factor, plant use factor, demand factor, diversity factor. | 5 |
| 2. | CIVIL STRUCTURES: (Limited only to the introduction of each term), civil engineering works: dams, earth fill, water conduits, spillways, and other open channels, surge tanks, general construction, hydraulic structure for power plants: Control of water delivery to turbines, control gates, Pumped storage installations. Penstocks; discharge tubes for hydraulic turbines, head losses, energy losses and efficiency. | 6 |
| 3. | Water resources | |
| 4. | HYDRAULIC TURBINES: Turbines for electric power generation, basics of Pelton wheel impulse units, Francis mixed flow, Propeller, Kaplan and Cross flow, power and efficiency; high, medium and low head applications, | 6 |
| 5. | Control of frequency and power loading, turbine instrumentation: speed calculation, Valve actuation, auto-start-up, thermal stress control, condition monitoring and power distribution instrumentation. | 3 |
| 6. | MONITORING regulation and monitoring: Hydroelectric power generation, automatic regulation and monitoring of voltage and frequency, modelling & Simulation: Computerized modeling & simulation of Electric Machines, data acquisition and logging. | 7 |
| 7. | PROTECTION: Principles of power system protection: system Vs apparatus protection, analog Vs digital protection, protection system components: potential and current sensors, relays, fuses, circuit breakers, Computerized status monitoring, zone protection, back up schemes, protective relays: Type and classification of relays, different types of relays: differential and percentage differential relay, impedance, admittance, reactance relays, distance protection concept, Carrier and | 8 |

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| | pilot wire systems, Significance of computerized protection systems. power circuit breakers: Arc characteristics, arc interruption, arc gaps, types of circuit breakers: air, oil, vacuum, SF6, automatic circuit re-closers, Apparatus protection: generator, transformer, transmission lines protection systems. | |